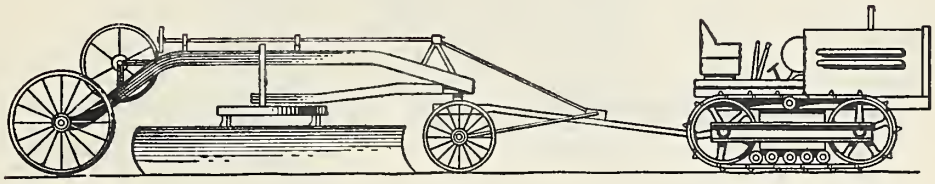
CONSTRUCTION



HINTS

UNITED STATES DEPARTMENT OF AGRICULTURE, FOREST SERVICE

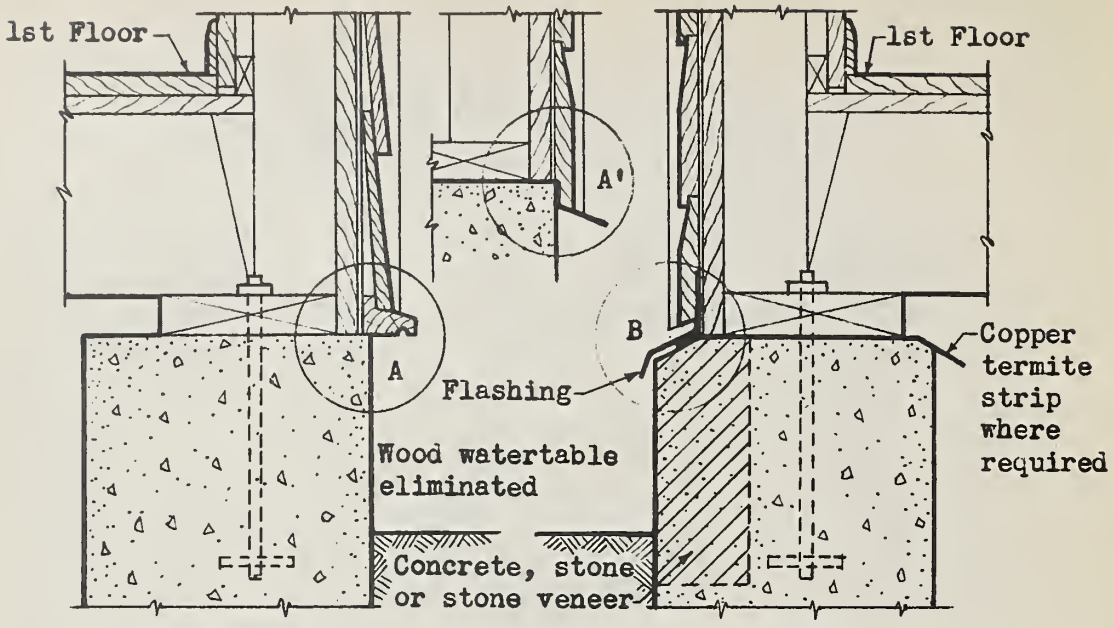
WASHINGTON, D.C.

Volume 5. November, 1939 No. 8.

The September issue of Construction Hints contained a reprint of a portion of Circular letter LC-556, issued by the National Bureau of Standards, in regard to automotive brake lining. Included in this issue, pages 7-10, is another portion of the same letter. Figures 1, 2, 3 and 4 referred to herein are those appearing on page 5 of the September issue and the reader is requested to refer to that issue for these figures.

Part I of the October 1939 issue of Proceedings - American Society of Civil Engineers carries an article entitled "An Improved Method of Adjusting Level and Traverse Surveys" on pages 1367-1385. This article should be of interest since it is claimed the results obtained are identical with those obtained by least squares, but the method is so simple as to be understandable by anyone possessing an elementary knowledge of algebra and surveying. Space will not permit reprinting of the article but it is believed copies of Proceedings are readily available to those interested.

E. S. Massie, Jr.,
Editor.



WALL SECTIONS

The common practice of placing the exterior faces of the superstructure of frame buildings outside those of the foundation masonry is incorrect and subject to criticism for the following reasons:

For frame buildings, the foundation walls should be and usually are, extended high enough above the surrounding ground to insure a seat for the frame superstructure, free from deterioration due to rainwater and dampness.

When, as at A and A', the studs are set so that the wood siding overhangs the masonry, after the fashion generally employed by carpenter foremen and builders, it creates a building larger than its foundation.

This appearance, exaggerated by the overhanging vertical cornerboards, is especially conspicuous when seen in perspective and gives the impression that the foundation walls are misplaced and inadequate for support.

By properly relating the frame superstructure to the foundation, as shown at B, and thereby entirely eliminating the further recurrence of this very noticeable error, the appearance would be greatly improved in conformity with correct principles of both practical, workmanlike construction and architectural design.

W. Ellis Groben

W. ELLIS GROBEN,
Consulting Architect.

Important Information on the New Dodges

In connection with the operation of the new Dodge Trucks, careful attention should be paid to the following items:

(1) Water pumps: Leaks are developing in the water pump seals after 2 to 5,000 miles of operation. We understand that the factory is making certain changes in the seal construction to eliminate this difficulty, details of which appear in this issue of Construction Hints.

It is important that engine cooling systems using Prestone be frequently checked for such leaks to prevent the possibility of developing weak anti-freeze solutions and subsequent freezing and cracking of engine blocks.

(2) Lubrication: The Dodge Company recommends the use of mild extreme pressure (E.P.) lubricants for transmission and differential in the Model TF trucks. S.A.E. 140 or 160 is recommended for summer operation and S.A.E. 80 or 90 for cold weather operation.

This material can be secured from any reputable manufacturer.

(3) Front wheel bearings: The instructions relative to adjusting front wheel bearings on the Dodges as described on page 4 wheel and tire section of instruction book, is somewhat misleading. Many camp mechanics have raised the question about tightening the wheel bearing nut rather than backing off in order to line up the cotter pin hole in the spindle with the slot on the nut.

In this connection the inner and outer cones of these bearings are numbers 2788 and 1755 respectively and these have been used by Dodge and other manufacturers for a number of years.

The time-honored method of adjusting the front wheel bearings applies to the Dodges and no difference in the usual procedure is required. It is well to mention, however, that the bearing cones should be set up snug in the cups, though not enough to bind the wheel. The nuts should then be backed off <u>just enough</u> to permit the wheel to turn freely. Tightness in wheel bearing seals or brake lining should not be mistaken for bearing tightness. Only the <u>slightest</u> bearing movement should be perceptible when the wheel is shaken.

O. Wiederhold.

ADDITIONAL INFORMATION ON DODGE WATER PUMPS

The following repair instructions have been received from the Dodge Company relative to eliminating water pump leaks on the Model TF trucks:

Subject: Water Pump leakage.

Water pump leakage in the above series trucks equipped with the pre-lubricated bearing has been due, generally, to abnormal wear of the fiber washer and, in some cases, to the fiber washer being located so near the wire retainer that with a slight amount of wear it would contact the retainer and there would be no pressure of the washer against the pump body seat and leakage would occur.

By following the procedure given below, both conditions can be eliminated.

1. Remove the impeller and pump shaft.

2. At a point 13/16" back from the bearing retaining ring slot drill and tap for a small zerk fitting. If the hole is drilled on a slight angle it will enter the pump body just back of the rear bearing and will not cut through the wall of the impeller housing.

3. Drill a 1/8" vent hole approximately 3/8" from the hole for the fitting.

4. Clean cuttings from pump body.

5. Close drain slot in bottom of pump body by soldering a metal plate over it. Then drill a 1/8" drain hole in the plate; do not fill the drain slot with solder or by welding.

6. Recondition the sealing surface of the pump housing, using refacing tool #C-551.

7. Remove the seal from the impeller and pack water pump grease around the seal thrust spring. This will provide lubrication between the seal and the shaft.

8. Install new seal and sealing washer on TE, TF and TG, TH trucks with motor numbers below T74-1460, T76-1858 and T78-1311 respectively, the seal, washer and thrust spring should be replaced.

9. Install the shaft and press the impeller onto the shaft until the two ears on the sealing washer are within 1/64" from the bottom of the slots in the impeller. This can be seen by looking through the inlet port of the pump. Then check the impeller for free rotation. If the impeller blades or hub interfere with the pump housing, remove the impeller and file for clearance. With the impeller located as outlined above, the ears of the sealing washer will not contact the retaining ring and hold the washer off its seat until maximum wear of the washer has taken place.

10. With the pump assembled, screw the zerk fitting into place and lubricate with a water pump grease having a high melting point.

In line with the foregoing instructions, the Washington Engineering Office dismantled a pump that had developed a leak after approximately 500 miles of service to determine if the method recommended would eliminate the difficulties. The leak in this case however, was not found to be past the fiber seal but under the rubber ring located directly behind the seal. This ring prevents leakage along the pump shaft and also from behind the fiber seal. The rubber ring is enclosed in a brass cup arrangement the interior of which is so shaped as to squeeze the ring against the shaft. It appears however, that in some cases the outer circumference of the rubber ring is of wider section than the inner portion so that when placed in the brass cup the inner portion is not pressed tightly against the shaft due to the outer circumference of the rubber ring riding against the inside of the brass ring.

This explanation will be readily understood by examining the ring in question.

In one pump examined a seal purchased from McQuay Norris Company was substituted for the Dodge rubber seal. So far no trouble has been reported. We do not recommend this procedure, however, except in emergency since the pump trouble is being discussed with the Dodge Company. We have also been advised by some camps that leaks were stopped by merely turning the fiber seal around.

The facts pointed out in the Dodge instructions relative to the location of the impeller (See paragraph 9) is of course important. If these instructions are not followed the fiber seal will not rub against the machined surface of the pump housing that acts as a seal with the fiber washer. When the pump is assembled and bearing lock ring in place, there should be a maximum possible movement for the spring to take up any wear that occurs in the fiber seal.

Most camps will not have the facilities available for soldering the vent hole and installing the zerk fitting as recommended by Dodge. The grease recommendation is probably intended to reduce the wear on the seal since it would be of little value in lubricating the ball bearing assembly because of the way this is sealed.

It is important however, that if the zerk fitting is installed that no attempt be made to overcome leaks by forcing grease past the seal. This would quickly load up the cooling system.

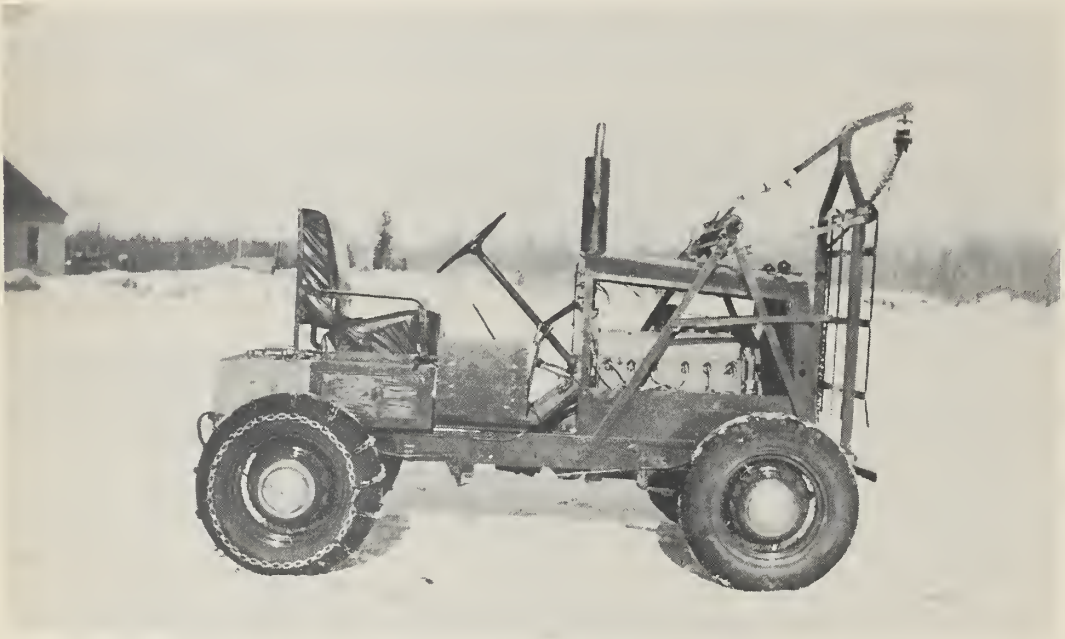
It is believed that if the instructions relative to the assembly of impeller on the pump shaft is followed and the rubber seal and spring is packed with water pump grease (preferably mixed with powdered graphite if this is available) so that the rubber seal, though snug on the shaft, can be slid along by the tension of the spring no chronic leaks will develop.

We also wish to point out that the pump can be removed without removing the radiator. This is accomplished by unbolting the fan from the pulley.

We have received reports that the pin holding fan hub to shaft has worked loose permitting the fan to tear up the radiator core. No investigation of this has yet been made.

It is important that water pump leaks be prevented to eliminate any possibility of freeze-ups due to lack of Prestone.

The pump trouble is being taken up with the factory and further advice will be issued shortly. It is also important that all pump difficulties be reported through the Regional Offices to Washington. This is essential in order for Engineering to determine the extent of the trouble and to furnish evidence to the manufacturer when adjustment is required.



The above photograph was submitted by A. H. Medendorf, Foreman, CCC Central Shop, Watersmeet, Michigan. The boys at the shop have nicknamed this piece of equipment the "Go-Devil", and use it for hoisting units out of chassis, transferring such units from department to department, and for many other useful purposes around the shop and yard.

A Chevrolet pickup chassis was modified by shortening torque tube 16" and the frame accordingly. The tread was narrowed by 9" and rear springs eliminated.

The unit is a real time and labor saver and was designed and constructed at the Watersmeet shop.

ADAPTING BRAKE LININGS TO BRAKES

The force which the driver of a car is required to exert on the brake pedal in order to produce a desired deceleration of the car is dependent on the linkage between the brake pedal and the brake, friction losses, the energizing action of the brake mechanism, and the coefficient of friction between the lining and the drum. From this it would seem that linings having a high coefficient of friction and large energizing effects would be the most desirable for a brake. Such is probably the case if these factors can be adequately controlled. From a practical standpoint, however, there are limits to this control and hence limits to the amount of energization which can be utilized and to the value of the coefficient of friction which can be employed. The more energization incorporated into a brake shoe mechanism the more necessary it is that the friction of the lining be correct and that it be maintained at the correct value. For instance, high friction linings or those which develop high friction under certain conditions will cause highly energized brake shoes to "grab". Low friction linings on brake shoes which have little or no energization may require a large force on the brake pedal. Neither condition is satisfactory.

In order for a brake to operate in the most efficient manner, the frictional characteristics of the lining should be suited to the brake mechanism on which it is used. In addition, the braking action should be distributed over as large an area of the lining and in as uniform a manner as is practicable. Such distribution will tend toward a uniform braking under different conditions and a minimum rate of wear.

Several steps or combinations of steps may be taken in order to accomplish the desired distribution of braking action and wear:

(1) Different types of shoe mechanisms may be combined in a brake,

(2) Different lengths of shoes may be used,

(3) In order to promote uniform wear over the whole area of lining, a faster wearing lining may be used on the shoe doing the less work,

(4) Stepped cylinders may be used in hydraulically operated brakes, so that a greater force is exerted on one shoe than on the other,

(5) Linings with different frictional characteristics may be used on different shoes.

The fifth procedure is practically a necessity in the case of some brakes and is desirable with many.

A general rule to follow in selecting a brake lining for a brake shoe is that an energized shoe requires a low or medium friction lining and a de-energized shoe requires a medium or high friction lining.

According to this rule the following kinds of lining would be selected for the brakes shown in figures 1 to 4.

Figure 1. High friction on bottom, and medium friction on top. However, the uses for this brake are quite limited, the energization is comparatively small, and it is common practice to use a high friction lining all around.

Figure 2. Medium friction on shoe (a), and high friction on shoe (b).

Figure 3. Low, medium, or high friction on shoe (a) depending on the location of the links, high friction on shoe (b).

Figure 4. Medium friction on shoe (a), low friction on shoe (b).

CONSTRUCTION OF BRAKE LININGS AS RELATED TO PROPERTIES

Three different types of lining are often referred to -- woven, folded and compressed, and molded. The essential difference is that the first two are made with either asbestos cord or cloth as a base, while the third is made with loose fibre as a base. All three types contain impregnating, binding, and filling materials which may vary greatly both in amount and in kind. The different types may be made flexible so that they can be adapted to any size of brake drum, or they may be made rigid so as to fit one size only. The type of construction or the degree of rigidity, however, do not determine the frictional characteristics. There is no agreement in the industry that one type of brake lining is necessarily superior to another, but a few general statements can be made as to the characteristics that may be expected.

Molded lining can be made with a greater range of compositions than is possible with the other types and more uniform frictional characteristics are possible -- though not always attained.

Linings having a very low coefficient of friction are practically always of the molded type.

For average use all types can be made with about equal resistance to wear, but as noted in Section "Wearing Qualities of Brake Linings", woven, or folded and compressed linings are superior for certain types of service.

On the whole, the quality is probably more important than the type.

COEFFICIENT OF FRICTION OF BRAKE LININGS

In the previous discussion reference has been made to linings having low, medium, and high coefficients of friction. The industry is not in complete agreement as to the lines of demarcation between these classes, or as to the method of measuring the coefficient of friction. In general, a coefficient of friction between 0.20 and 0.30 is considered low, between 0.30 and 0.40, medium, and above 0.40, high. The difficulty of grouping linings in these apparently simple classes is that even the best linings may show a variation in coefficient of friction of 0.10 for different conditions, so there may be considerable overlapping Furthermore, in rating linings where such a variation occurs, it is not always clear as to whether the rating is based on minimum, maximum, or average values.

Variations in the coefficient of friction may result especially from two extreme conditions to which linings may be subjected in service, (1) moisture, and (2) high temperatures resulting from frictional heat.

It appears that none of the usual types of brake lining will hold satisfactorily if the brake is flooded with water; that is, the coefficient of friction may drop to perhaps 0.10 or even lower. On the other hand, a very small amount of moisture will cause many linings to "grab", due to a temporary rise in the coefficient of friction -- sometimes to a value as high as 0.60. Although the best linings will lose friction when flooded with water they will recover quickly as they dry and will show little, if any, tendency for the coefficient of friction to rise above a normal value.

The loss of friction of lining at high temperatures is commonly referred to as "fading". It is generally considered that any lining will "fade" if the temperature is sufficiently high. A good lining, however, will stand temperatures up to 350°F, as measured on the surface of the brake drum, without fading. Many linings will stand 500° or more. Some types of lining have a tendency to increase in coefficient of friction with a moderate rise of temperature, and some to decrease. By combining such linings on the shoes of the same brake a more uniform action may result than would be indicated by the variation in friction of the individual linings.

WEARING QUALITIES OF BRAKE LININGS

A good brake lining might be defined as one with the desired frictional characteristics together with a low rate of wear. Many linings are available which meet these requirements under ideal conditions but the actual rate of wear is dependent on other things than the lining itself. For instance, a scored drum will produce rapid wear of the lining. Even a drum that has been newly turned or ground may show rapid wear at first. For minimum wear the brake drum should be polished to a mirror finish. High drum temperatures, also, will usually result in a much increased rate of wear. If mud and grit accumulate in the brake drum an abnormally high rate of wear often results. In some parts of the country this condition exists to such an extent that it is usually recommended that all linings be of the woven or folded type, regardless of other characteristics. A lining of this kind apparently permits the particles of grit to accumulate in the interstices of the fabric instead of cutting into it.

PURCHASE OF BRAKE LININGS

The car manufacturer usually buys his brake linings on quite rigid specifications and requires that a given force applied to the brake pedal shall produce the desired deceleration of the car, and that this decleration shall not be adversely affected by conditions under which the automobile may be operated. In replacing brake linings it should obviously be the aim to use those linings which will give the car the same braking action which it had initially.

The question naturally arises as to how the consumer can determine what kind of lining to use on a given brake. Most of the important manufacturers of brake lining market several, or perhaps many, kinds of brake lining intended for different purposes; accordingly, the name of the manufacturer alone is not sufficient to determine the quality of a lining or the suitability for a particular brake. The characteristics of a lining cannot be determined from the appearance, and linings are not usually labeled in any way intelligible to the layman. Furthermore, the individual car owner is usually not familiar with the type of brake on the car, and it is not always easy to obtain this information. Such being the case, the individual can best deal with the distributor of his particular car, or with a reliable concern which makes a business of relining brakes. Most of the important manufacturers of brake lining put out sets of lining designed to give the best performance on each particular brake.

Large users, on the other hand, may find it advantageous to buy on specification provided means are available for measuring the performance, either in the laboratory or in service.

A fatal accident occurred recently in one of the Regions in which the victim enrollee was acting as operator of a rock crusher. His duties included dumping contents of the bins into trucks by means of a lever and a trap door, also inspecting contents of the bins.

In summing up the accident, the Region states, "To prevent a recurrence of this sort, a hinged guard made of 1½" x 1½" x 1/4" angle iron covered with heavy wire mesh (3/8" opening 0.162 wire) should be placed over the end of the revolving screen and bevel gears and fastened with a hasp and padlock. In addition it is recommended that a cut-off circuit connected to the crusher motor be installed and a safety switch conveniently located outside on the platform above the crusher jaws, and one on the platform at the revolving screen. This would provide an additional means of stopping the motor quickly in case of any emergency."

SAFETY SAYINGS

From DAILY NEWS - INTERMOUNTAIN REGION, October 23, 1939.

Tom Jones has gone to heavenly heights; he tried to drive without his lights.

Jack Hayes this busy life forsakes; he never would reline his brakes.

Here's all that's left of Amos Rossing; he tried to beat it to the crossing.

No more from Brown are earthly smiles; he took the curve at fifty miles.

Ted Small has gone to his abode; he kept the middle of the road.

Here lies our friend, poor Tony Dix; for booze and gasoline won't mix.

Camp Hutchins Creek F-8, Shawnee National Forest has developed a Gravel Spreading Gauge. On this and the succeeding pages are given instructions on the gauge, the bill of materials needed for its construction and a set of plans.

INSTRUCTIONS ON GRAVEL SPREADING GAUGE

This gauge has proved very satisfactory in applying aggregate to the road subgrade for surfacing purposes since the amount of material desired may be accurately regulated in a uniform windrow. This is especially important in applying stabilized surface where proper proportioning is essential.

The gauge may be constructed entirely of rough timber, lumber and materials on hand and no effort should be made to reduce the weight of any of the parts since such weight is advantageous in keeping both runners on the subgrade at all times. A lighter weight machine tends to lift over the gravel thereby causing non-uniformity in spreading.

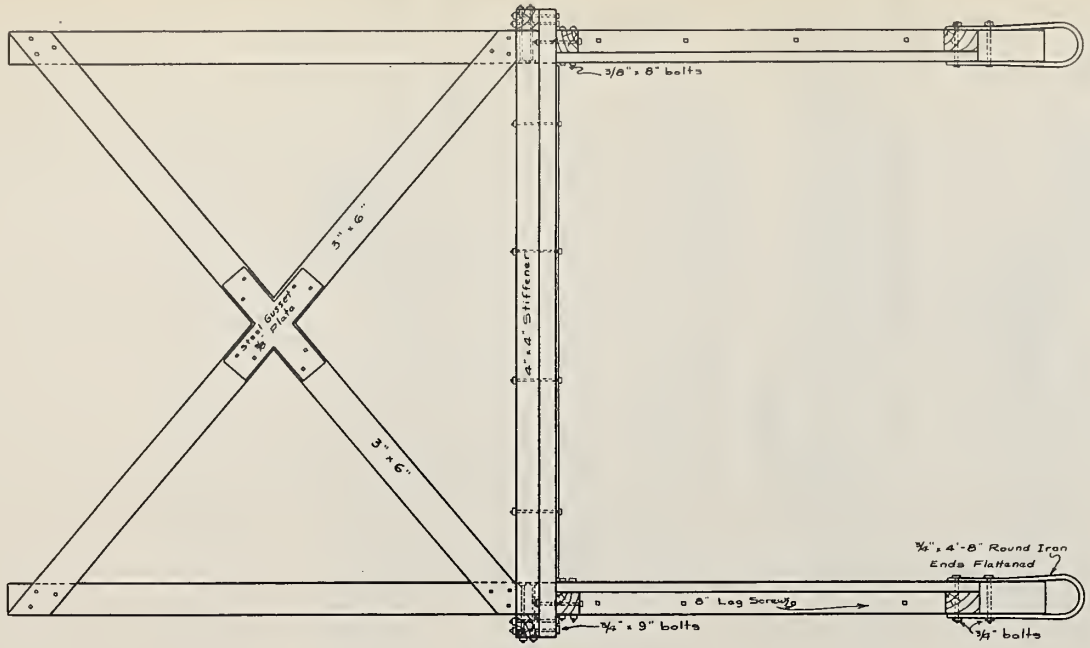
The gauge is pulled with a small "20" or "30" tractor by means of eighty feet of 5-8" cable, the ends of which are attached to the two runner clevises with cable clamps. To offset the tendency of the runners to pull inward at the front ends, a spreader made of 4" channel iron, 8'-6" long, should be attached to the cables holding them eight feet apart at a distance of thirty five feet. At this point the cables converge to a drawbar hitch. The spreader is attached to the cables by one 5-8" U-bolt clamp at each end.

In use, the gauge is placed in position along one side of the road, trucks coming from behind, drive alongside of tractor and back into the front end of the gauge when the load is dumped well back, near the cross wall. The truck then pulls out and the gauge is drawn forward until the load is spread.

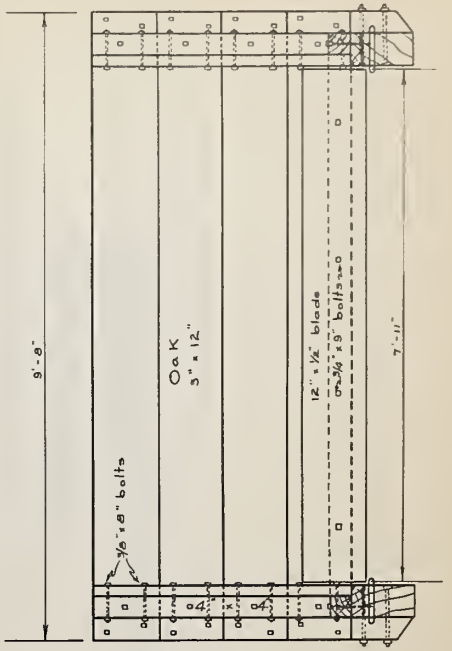
Worn out grader blades may be fastened to the under sides of the runners by means of lag screws to prevent excessive wear.

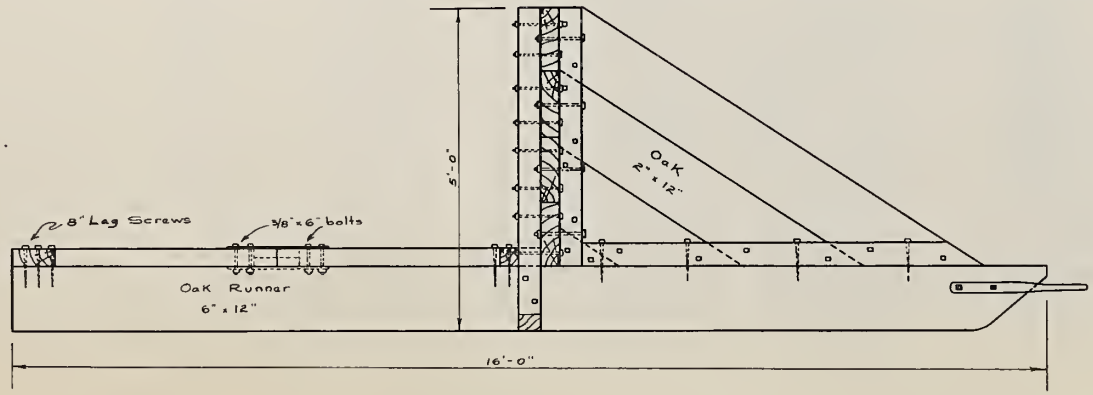
BILL OF MATERIALS FOR GRAVEL SPREADING GAUGE

QUANTITY	UNIT	DESCRIPTION AND USE
2	Pc.	6" x 12" x 16'-0" Oak - Runners.
2	"	3" x 6" x 12'-0" " - Cross Braces.
40	Lin. Ft.	3" x 12" Oak Backing.
40	" " .	2" x 12" Oak - Sides.
42	" " .	4" x 4" Oak - Stiffener, Side stripping.
10	" " .	3-4" Diam. Round iron, Draw eyes.
2	Doz.	8" Lag screws.
3	"	3-4" x 9" Bolts (with washers).
4	Pc.	3-4" x 12" " " " .
8	"	3-8" x 6" " " " .
14	"	3-8" x 8" " " " .
1	"	3-8" Boiler Plate (Cut as shown) Gussett.
1	"	1-2" x 12" x 7'-11" Steel Blade- Gravel Topper.



Scale: 3/4" = 1'-0"





GRAVEL SPREADING GAUGE

Shawnee — N'tl Forest

Designed: HNJ & HSM	Scale: As shown
Drawn: HNJ	Date: 10-25-39
Traced: JsB	Checked